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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,098	04/02/2004	Xiao-Feng-Li	INTEL/17590X-CIP	2151

34431 7590 01/30/2008
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EXAMINER

WANG, JUE S

ART UNIT	PAPER NUMBER
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2193

MAIL DATE	DELIVERY MODE
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01/30/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/817,098

Applicant(s)

LI ET AL.

Examiner

Jue S. Wang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 November 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-36 have been examined.

Specification

2. The specification is objected to under 35 CFR 1.75 because there is no description for the "machine readable medium" recited in claims 25-36. It should be known that "air", "wireless transmission", and the like are machine readable media, but they are non-statutory claim subject matters. Accordingly, the specification fails to limit "machine readable medium" to embodiments which fall within a statutory category.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al., "Value Speculation Scheduling for High Performance Processors", (hereinafter Fu), in view of Calder et al. "Value Profiling and Optimization", (hereinafter Calder)

5. As per claim 1, Fu teaches the invention as claimed including a method comprising:

identifying an instruction (see page 266, Fig 7, steps 1-4, page 266, section 3);

receiving a plurality of value patterns (see page 265, Fig 6, right column, last paragraph);

selecting at least one of the plurality of variable value patterns based on an accuracy (see page 265, Fig 6, page 266, left column, first paragraph);

determining a predicted value of the instruction based on the at least one selected pattern (see page 263, left column, last paragraph, page 264, right column, paragraph 2, see page 265, right column, last paragraph);

using the predicted value of the instruction based on the pattern to generate a value prediction instruction to predict a run-time value (see page 263, Fig 3, left column, last paragraph, page 266, Fig 7, step 5); and

combining the value prediction instruction with the one or more machine readable instructions (see page 263, Fig 3, page 266, Fig 7, step 5, right column, last paragraph).

Fu does not teach that the steps of identifying and determining a predicted value is performed for a variable and that a predicted value of the variable is used to generate a value prediction instruction.

Calder teaches profiling the value of variables and that value profiling is a valuable tool in guiding the type of speculation scheduling performed by Fu (see section 2.2 and section 6).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Fu such that the steps of identifying and determining is perform for variables instead of instructions so that a predicted value of the variable is used to generate a value prediction instruction as taught by Calder because many

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instructions that are hard to predict or have variant behavior actually access data (variables) that are invariant or are very predictable (see page 16, last paragraph of Calder).

6. As per claim 2, Fu further teaches determining if the run-time value matches the predicted value (see page 263, Fig 3, line 18, page 266, Fig 7, step 7); and generating a value correction instruction to correct the run-time value if the run-time value does not match the predicted value (see page 263, Fig 3, page 266, Fig 7, step 8, page 267, left column, paragraphs 2, 3).

7. As per claim 3, Fu further teaches combining the value correction instruction with the one or more machine readable instruction to be executed subsequent to an invocation of a speculative parallel thread (see page 263, Fig 3, right column, last paragraph, page 264, Fig 4, left column; EN: The execution of instructions I4, I5, and I6 are speculated via instructions I4', I5', and I6' which can execute in parallel with instructions I1, I2, and I3. The execution of the patch up code must be executed after the invocation of the speculated execution of instructions I4', I5', and I6' because the patch up code depends on instruction I3 for the value in register R4 whereas I4' is speculatively executed by breaking the dependency of I4 on I3 by predicting the value in R4.)

8. As per claim 4, Fu further teaches combining the value prediction instruction with one or more machine readable instructions to be executed prior to an invocation of a speculative parallel thread (see page 263, Fig 3, right column, last paragraph, page 264,

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Fig 4, left column; EN: the value prediction instruction I7 is executed prior to the speculated execution of instructions I4', I5', and I6' since the execution of I4' depends on the value in register R8 defined in I7).

9. As per claim 5, Fu modified by Calder further teaches the variable is associated with a data dependency (see page 266, Fig 7, steps 1-4, right column, paragraphs 2, 3).

10. As per claim 6, Fu further teaches the one or more machine readable instructions comprises an internal representation (see page 263, Fig 3).

11. As per claim 7, Fu further teaches that the one or more machine readable instructions comprises a source code file (see page 263, Fig 3).

12. As per claim 8, Fu does not teach that the source code file comprises a high-level instruction.

Calder teaches performing code specialization based on value profiling for machine instructions in a source code file where the source file comprises a high-level instruction (see Figure 12, page 23, last paragraph, and page 24, paragraphs 1, 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Fu such that the source file comprises a high-level instruction as taught by Calder because programmers might want to inspect the code with value prediction instructions for purposes such as debugging and performance evaluation, and it is easier for programmers to understand high level code rather than low level code.

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13. As per claim 9, Fu further teaches that the at least one selected pattern comprises a predetermined pattern (see page 265, Fig 6, right column, last paragraph).

14. As per claim 10, Fu further teaches that the determined pattern comprises at least one of a constant pattern, a last-value pattern, and a constant-stride pattern (see page 265, Fig 6, right column, last paragraph).

15. As per claim 11, Fu does not teach that the constant pattern is based on a most frequent occurring value.

Calder teaches value profiling for variables to identify the most frequent occurring value for the variable (see page 5, paragraphs 4-6, page 6, paragraph 1-2, section 4.2, and section 6).

16. As per claim 12, Fu further teaches that the predicted value is created by a profiling technique (see page 266, Fig 7, steps 1, 4, page 266, right column, paragraph 2).

17. As per claims 13-24, they are the apparatus claims of claims 1-12. Therefore, they are rejected using the same reasons as claims 1-12.

18. As per claims 25-36, they are the machine readable medium claims of claim 1-12. Therefore, they are rejected using the same reasons as claims 1-12.

Response to Arguments

19. Rejection of claims 1-36 under §103(a):

20. Applicants' arguments with respect to claims 1-36 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Gabbay et al., "Can Program Profiling Support Value Prediction?", 1997, Proceedings of the 30th annual ACM/IEEE international symposium on Microarchitecture, pages 270-280. This document is cited to teach performing program profiling for value prediction using different value predictability patterns.

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP §706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than ~~SIX MONTHS~~ from the mailing date of this final action.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jue S. Wang whose telephone number is (571) 270-1655. The examiner can normally be reached on M-Th 7:30 am - 5:00pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on 571-272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jue Wang
Examiner
Art Unit 2193



WILLIAM WOOD
PRIMARY EXAMINER